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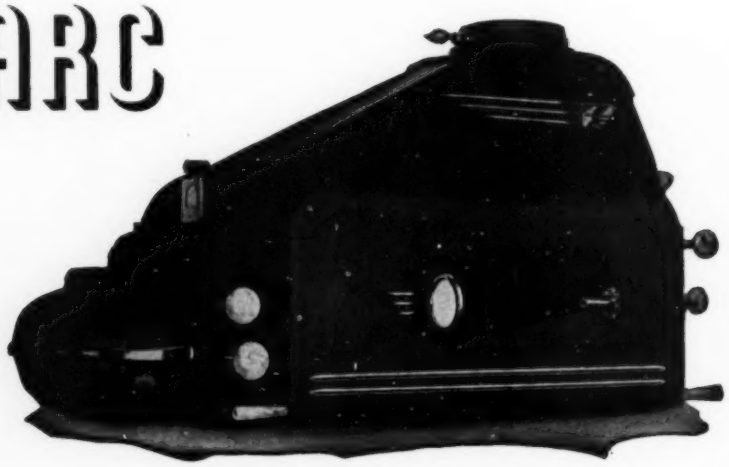

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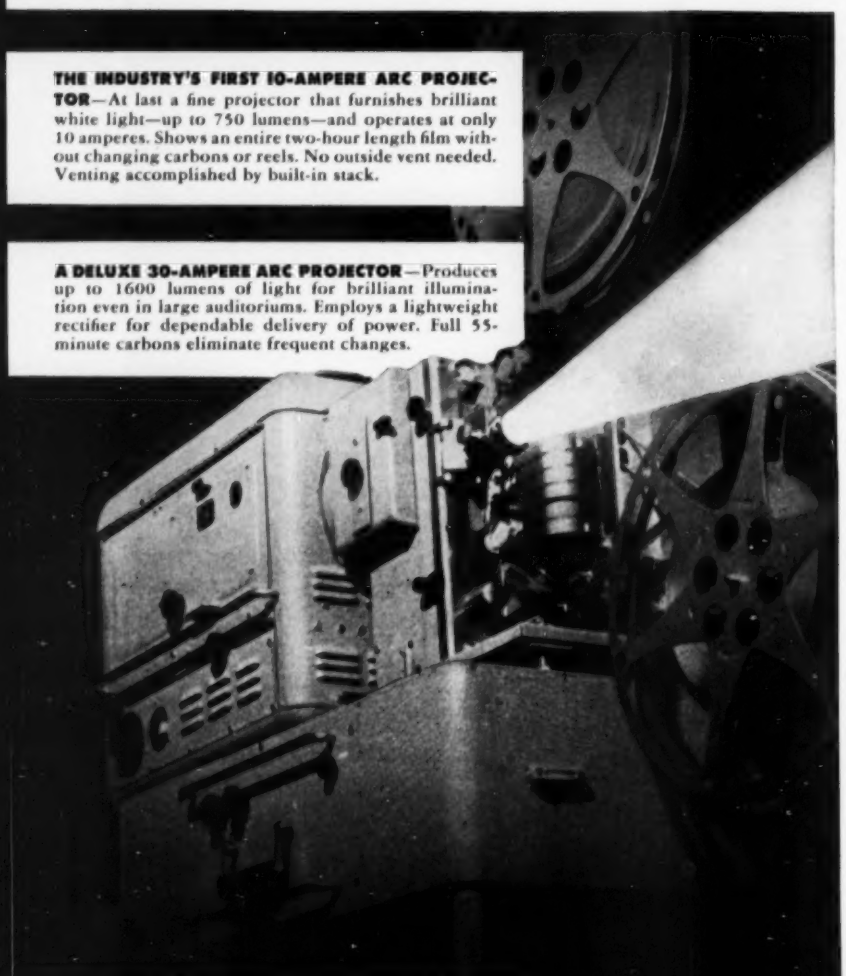

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INTERNATIONAL PROJECTIONIST

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JAMES J. FINN, *Editor*

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MONTHLY CHAT

NOTHING has occurred during the past four weeks to change IP's oft-repeated estimate of the worth of the various "new" processes being offered to the theatre exhibition field. We still adhere to the view that for the majority of theatres an investment of about $800 tops for a pair of lenses, a new screen and a bit of construction work on the stage area will enable the showing of anything that hoves into view. This excludes the 20th-Fox CinemaScope process, but since this is strictly a wide-screen proposition, a couple of wide-angle lenses and proper screen masking (or a screen surround) will give a comparable effect.

The controlling factor in all installations is the physical aspect of a given theatre.

How many theatres can accommodate a screen width of 60, 50 or 40 feet? We'll wager that the *average* for most theatres will be about 30 feet. So, why do we need special lenses at great cost when all that is needed are a couple of standard wide-angle lenses? Does anybody believe that 20th-Fox will shoot exclusively in the CinemaScope process? If so, how many customers will they have among the bulk of theatres when the dust settles down?

These considerations lead naturally to an estimate of stereophonic sound. Thus far the process has been grossly mishandled, mainly because the so-called stereo sound effect is just that and no more, the extra tracks carrying only additional effects for pictures which were shot almost two years ago. What will stereo sound add to a 30-foot picture. The horns required will just fit behind a 30-foot screen. And is there a directional impact from left- and right-hand screen sides with a 30-foot screen.

Paramount has just issued a 5-page directive for projectionists intended to overcome "projection deficiencies" which are causing "unfavorable audience reaction." This seems to us the veriest nonsense, because after we comply to the dot with the line-up directives, why do we still have to frame constantly? The fault lies in the *taking* not the *showing* of 3-D pictures.

A WORD OF CAUTION: beware of these inclusive "package" deals now being blithely offered. First, the buyer will probably get not only *more* equipment than he needs and, possibly, the wrong kind. The extreme shortage of lenses will flatten many of these "packages" into an empty paper bag.

Don't forget: any good screen image must be not only *wide* but *high* (and if in color, *handsome*). We still like the 1.85 to 1 (or even 1.75 to 1) ratio.

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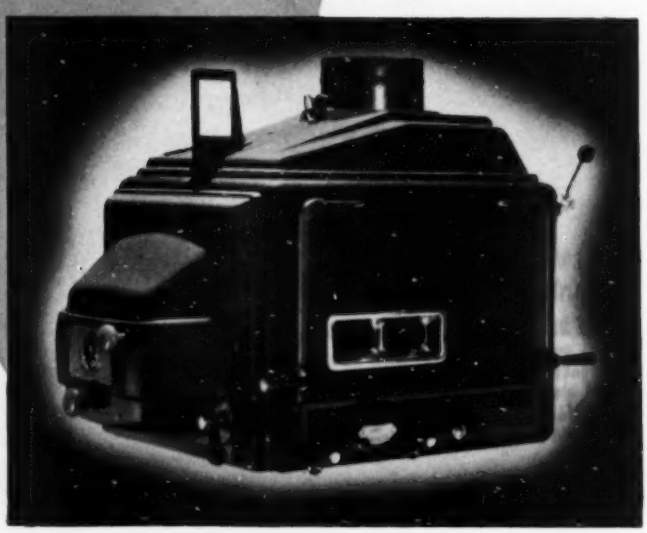

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THERE'S A BRANCH NEAR YOU

VOL. 28 NO. 6

JUNE 1953

Wide-Screen Single-Film 3-D Predicted

This is the first integrated 3-D camera as developed by J. A. Norling, as contrasted with the double-unit cameras which were hastily assembled and pressed into service for the first 3-D pictures. The Norling camera is unique in that it is the only one that permits variable interaxial spacing of from 1½ to 4 inches.

A micrometer knob mounted between the lenses enables the cameraman to quickly adjust convergence. The single camera body compactly accommodates two film strips and handles as easily as a conventional camera, for extreme flexibility.

Appended hereto are excerpts from a paper presented recently before a distinguished scientific organization by John A. Norling, whose accomplishments in the stereoscopic motion picture field have won world-wide acclaim. Mr. Norling has contributed profusely to the technical literature on the art, including articles which appeared in IP during the past 20 years.

"THE FULL possibilities of 3-D have not been explored," John A. Norling told 400 optometrists at the recent Central Atlantic Optometric Assembly in Atlantic City. "We look forward to wide-screen 3-D as an early embellishment of the art," predicted Mr. Norling, chairman of the Stereoscopic Motion Picture Committee of the SMPTE, "and to the eventual wedding of binaural sound with wide 3-D"

Shown in full color, 3-D pictures carry naturalness to a point where the illusion is substantially complete and observers are likely to lose all sense of looking at pictures, said Mr. Norling, "provided the 3-D presentations do not contain *depth distortions* and exhibit other technical faults."

Limits of Binocular Vision

Any sensation of visual discomfort in viewing stereo movies is the penalty for exceeding certain geometric limitations imposed by Nature upon the use of our two eyes simultaneously, Mr. Norling explained. "Its cause is cumulative and lies in the breaking of one or more of a few exceedingly simple rules."

The cine-stereo expert continued: "Complete visual comfort can be attained in stereo movies only if the two images are projected simultaneously, if they are rock-steady, if they are of equal brightness, if they are of equal contrast, if far distant points are not separated too far in one image from that of the other, and if they are of exactly the same size."

Requirements for Good 3-D

Mr. Norling discussed and demonstrated with stereo slides how 3-D films are made and projected so as not to exceed the tolerance of visual functions. In his opinion, good 3-D depends on:

1. Using lenses closely matched in focal length to limit differences in image sizes to one half of one %; or one inch difference in height size between two superposed images on a 18 by 25 foot screen.

2. Vertical alignment: one image should not be higher or lower than the other.

3. Rotation: two images should be in accurate attitude alignment.

4. Illumination negatives should be matched in contrast and density. The depth effect disappears and visual discomfort ensues when one image is darker in projection.

5. Normal depth and appearance of objects and people.

6. The use of a "stereoscopic window"—that imaginary portal through which the projected picture is viewed—is another requirement of good 3-D presentations. To form the "window," 3-D cameras must have a means of

converging the lens axis to any desired plane, usually to a plane in front of the nearest object.

Improper Camera Techniques

Improper photographic techniques, usually wrong interaxial spacing (distance apart) of the camera lenses, results in "misinterpretation." This means observer confusion about spatial relationships, sizes of objects and shapes of persons. Deeper-than-normal scenes and strange forms of well-known objects conflict with the audience's experience.

Proper interaxial spacing is calculated for the ultimate size of the projected picture. Example: a linear magnification of about 360 times is the determining factor for a standard 25 foot screen.

Too large interaxial spacing will cause the picture to suffer from "miniaturization." Objects and people will look smaller than they should, and the depth of the scene will be abnormally increased in relation to the real spacing of objects.

Too small interaxial spacing causes "giantism"; people and objects appear too large, and depth becomes drastically reduced.

Mr. Norling discussed the features of all the cine-stereo cameras now in use; 3-D projection; dual images on one film; the anamorphoser lens system; the beam splitter; sequential frame projection; improved single-film systems; free-vision 3-D: the grid system; and the possibilities of stereoscopic motion pictures.

In speaking of 3-D developments, Mr. Norling revealed that the "stereoscopic window" was not a necessity "if certain 3-D photographic and projection procedures are employed. It is perfectly possible to have 3-D pictures existing in space whose margins are vignetted, gradually shaded off from outer darkness to the full illumination of the picture itself. Some optical problems exist in the methods of doing this, but they are not very difficult to solve."

The pioneer 3-D producer and designer of the cine-stereo camera bearing his name asserted: "Whatever the course of development of the 3-D art, one thing is certain: All the fundamental rules applying to proper photography and projection must be observed. Infraction of any one of these rules may set up visual disturbances; may give the audience an unpleasant experience."

Mr. Norling voiced his own opinion and that of the SMPTE when he concluded: "3-D cannot afford to break even one of the simple rules for producing and projecting good stereoscopic motion pictures."

Those who are interested in a detailed description of several proposed methods of getting the two stereo images on one film should refer to the August, 1951, and February, 1952, issues of IP where Mr. Norling discusses the anamorphoser lens system, the beam splitter, sequential-frame projection, the grid system and various other methods of single-film stereo projection.

3-D As Viewed From Olympus

RECENTLY in the know-all-and-yet-know-nothing citadel of culture known as Hollywood, Calif., there appeared before the Motion Picture Industry Council a Mr. M. L. Gunzberg, president of Natural Vision Corp., the sponsors of the process which is responsible for various 3-D Motion pictures now available in various theatres in the United States and elsewhere.

Mr. Gunzberg, whose contributions to the technology of motion pictures have been widely publicized, seized the aforementioned occasion to divest himself of some rather extraordinary comment relative to the "principles" behind his Natural Vision process, including the reliance upon "convergence" rather than the "variable interocular" method used in "other 3-D systems."

As reported in *Motion Picture Herald* (May 9 issue) Mr. Gunzberg's thought processes are as follows:

"Normally, the eye doesn't stare straight ahead—as do the cameras in the variable inter-ocular method of shooting. In normal vision, the eyes converge on the subject that a person is looking at—and the area of vision is more or less concentrated. The cameras used in the Natural Vision method of shooting are set up so that they provide a natural convergence on the subject of greatest interest—just as the eye has a natural convergence.

"To our knowledge, ours is the only 3-D system which has developed and emphasized 'convergence' and all the accompanying physiological and psychological factors."

He recognized that there had been some complaints of eyestrain in connection with films utilizing the Natural Vision process, but contended they stemmed from inadequacies in projection or in unrecognized eye defects. On the whole, he declared, viewing properly photographed and projected 3-D films is excellent therapy for the eyes and adds to the general audience enjoyment of a motion picture.

As to cries for "standardization," he pointed out that all 3-D films are projected on the same types of projectors, with reels of identical size—that complete standardization virtually exists as to films using the "stereo" method.

A Commonplace of the Art

Gunzberg's assertion that the Natural Vision 3-D cameras are the only ones that employ convergence is totally unfounded in fact. He further distorted the truth when he states that cameras employing variable interaxial shoot straight ahead and do not employ convergence. Actually, convergence as well as variable interaxial has been employed by Spottiswoode and Norling.

Spottiswoode described his principles of convergence in the SMPTE *Journal* for October, 1952. Norling has upon numerous occasions described his employment of both convergence and interaxial spacing control, both of which he has used since 1936.

Gunzberg's statement that his 3-D system is the only one that has developed an emphasizer convergence and all the accompanying physiological and psychological factors will come as a surprise to all those who have had any experience in cinesteregraphy.

Eyestrain is Fact, Not Fancy

Actually, complaints of eyestrain in connection with films utilizing the Natural Vision process is set up not only by inadequacies in projection but also in the faulty techniques notoriously used in the Hollywood "show-off" utilization of the 3-D process.

See the statement by Dr. Leslie Knopp, president of the British Kinematograph Society, which appeared in the IP story anent the recent SMPTE convention (page 18, IP, May 1953).

— JAMES J. FINN

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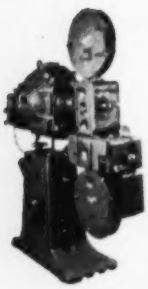

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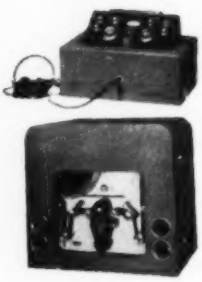

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Visibility Factors in Projection

2. Light Problems of 3-D and Panorama

By ROBERT A. MITCHELL

NATURALNESS and lifelikeness in conventional theatre movies are of a high order, but nevertheless restricted by screen area, 2-dimensional pictorial reproduction, a film speed too low to permit the smoothest delineation of motion, and an intermittent pull-down speed too slow to overcome the effects of shutter-flicker at high light levels. In addition, ordinary movies are handicapped aurally by unidirectional sound—emanating at all times from the middle of the screen.

Despite these limitations, conventional movies are much easier on the eyes than any of the current panoramic and stereoscopic presentations. They do not induce eyestrain in persons of normal vision even when viewed from positions close to the screen for long periods of time. Much of this excellence is due to the untiring efforts of the projectionist.

Rapid Motion 'Jumpiness'

Direct-camera, or "live", Tv does indeed permit a smoother and less "jumpy" delineation of rapid motion than does the 24-frame per second motion picture. This is because Tv's 30 interlaced field-scannings per second are virtually equivalent to 60 frames per second. But no one dares risk his neck by declaring that Tv is less rough on the eyes than regular movies. A Tv image has comparatively low definition, is subject to many kinds of visual "static" and transient distortions, has a harsh violet-white glare, may bombard the eyes with invisible high-frequency rays.

Panoramic and stereoscopic pictures may induce severe visual fatigue because of characteristics inherent in such processes. Polarized-light 3-D, for example, is hard on the eyes when the "successive-frame" system is used—one frame visible only to the right eye, the next frame to the left eye, the third to the right eye, *etc.*

Causes of 3-D Eyestrain

When the right and left images are projected simultaneously, it is tiring to watch if the stereo pairs are not properly superimposed and maintained in correct registration. (Slight vertical misalignment will give the effect of a blurry picture until the muscles of one eye have been strained to accommodate the incorrect configuration. This causes mild eyestrain.)

Now, can that intangible "something" called *picture-visibility* be taken apart and broken up into separate factors for evaluation? Such an analysis should be advantageous.

The size of the screen may be taken as an elemental, if elementary, factor of picture-visibility. It is undeniably a significant factor at the present time, for the proponents of panoramic projection would greatly enlarge our screens. In Cinerama and CinemaScope projection, the screen is not only widened, but also curved.

How Big a Screen?

As we stop to consider the visual effects of a wide, curved screen, however, a number of related, but different picture-visibility factors come to mind. The *shape* of the picture, for instance. Would it be a mistake to alter the time-tested and eminently serviceable 4 by 3 proportion of the screen? Or suppose that a single film is used for the panoramic projection, as in CinemaScope. Will the picture be *bright* enough, *clear* enough? And if the proposed screen be curved, will *perspective-distortion* spoil the appearance of the picture for patrons seated outside of a very small optimum viewing-space?

Well for us, then, to consider all of these and other picture-visibility factors, heading the list with "size of picture."

SIZE OF PICTURE

If a screen be too small in relation to the size of the auditorium, audiences will be too far removed from the picture to obtain a feeling of emotional participation in the drama. The small picture will be hard to see, and much of the pictorial detail will be invisible.

If, on the other hand, the screen be too large, patrons will not see the forest for the trees—closeups will reveal beauty-spots, but no beauty. Action sweeping in all directions over an *enormous* screen requires excessive activity of the eye-muscles to follow it. Visual fatigue results. And the effectiveness of long-shots is lost because the screen cannot be "taken in" at a glance.

Film Grain Magnified

Equally as important is the fact that photographic and projection defects are magnified *in the same proportion as the picture itself.* Emulsion graininess, camera, printer, and projector unsteadiness, and the inherent jerkiness of objects in rapid motion become objectionable faults when the picture is too big for the auditorium in which it is shown. Big screens necessitate lenses of shorter focal length: *focus becomes exceedingly critical,* and film-flutter and buckling more prominent.

Then too, the eye is "drowned" in the flickering light of the oversize picture; this contributes to eyestrain. All movies flicker to some extent because photographic development of the film is never absolutely uniform, and also because moving objects in the picture constantly vary the amount of light reflected to the eyes by the screen. This is one of the reasons why most people avoid the front seats.

There are other objections to super-colossal screens. The problem of supplying adequate illumination to a large screen is serious, and shutter-flicker of the standard 48-cycles per second frequency is highly visible to the peripheral areas of vision (that is, the action of the rotating projector shutter can be perceived from "the corner of the eye" more readily than in the center of the field of vision—and giant screens require wide visual angles).

Not all of these objections apply to special wide-screen processes, such as Cinerama. Because Cinerama employs three conjoined projected images, emulsion graininess, focus difficulties, film-flutter, and illumination deficiencies do not arise as serious problems. And the scenes are all long-shots. Peripheral flicker is slightly reduced in Cinerama by a film speed of 26 frames per second, resulting in a cutoff-frequency of 52 cycles per second.

CinemaScope's Problems

In the case of CinemaScope, however, the objections are all the more

serious because the size of the film-frames is the same as in ordinary 35-mm projection. The wide image is "compressed" into the frames by means of cylindrical lenses. As for the effects of emulsion-graininess and poor focus in CinemaScope, vertical lines are more blurry than horizontal lines! Because CinemaScope is illuminated by only one arc, adequate lighting poses a tough problem.

The 35-mm film-frame can take only so much light and heat, and the limit seems to have been reached already in the larger theatres and in drive-ins. CinemaScope film-speed is standard, but lower picture-brilliance will mask peripheral flicker.

As a rule, the width of the *conventional* 4 by 3-proportioned screen should not be less than 1/6th nor more than 1/4th the distance from the middle of the screen to the farthest row of seats. Thus the screen in a theatre having a maximum viewing distance of 80 feet should be from 13 to 20 feet wide. Panoramic wide-screen setups increase screen-width approximately 2½ times.

SHAPE OF PICTURE

The least "arbitrary" shapes that a picture can have is the circular form. Experience has shown, however, that for some obscure psycho-visual reason, a perfectly round screen is highly unsatisfactory. The earliest Tv picture-tubes were round. Even present-day Tv screens, having bowed edges, are unsatisfactory. We do not know why most people prefer pictures bounded by straight lines, but the fact remains that they do.

The square is the simplest geometrical figure bounded by four straight lines. In the early days of sound pictures, the standard silent-film projector apertures were used, the sound track being concealed by a sliding mask. This resulted in a nearly square screen image. No one liked a picture of that shape, so the old 4 by 3 width-to-height ratio of the rectangular silent aperture was restored by reducing the height of the frames. It is interesting to note that approximately 6 feet of film in every 1000-foot reel is wasted by the increased thickness of the frame-lines.

Nature is Panoramic

Why is a horizontal, rectangular screen-picture preferred to a square one? For one thing, the natural field of vision of our eyes can take in a wider angle horizontally than vertically. Most action takes place in the horizontal, rather than in the vertical, plane. Most of the scenes in nature are panoramic, having a pictorial axis parallel to the horizon and perpendicular to the earth's gravitational pull. In the final analysis, therefore, the law of gravity is responsible for our horizontal, rectangular screens!

The "esthetic" desirability of the 4 by 3 proportion is nothing more than a utilitarian compromise between the visual "framing" of natural landscapes and the preponderance of horizontal movement, on the one hand, and scenes of persons standing upright, on the other. An actor, or even two or three in a group, appears lost on a movie screen 2½ times wider than high.

How are visual and dramatic centers of interest to be focused on a screen that "surrounds" the audience? The close-up is one of the most useful photoplay techniques ever devised. Panoramic screens cannot employ the close-up without appearing clumsy. Ingenious panoramic-film cinematographers must devise a workable substitute for it.

BRIGHTNESS

According to present-day standards of projection illumination and print density, a picture is deemed suitably brilliant if the screen has at least 15 footlamberts of brightness when illuminated by a running, unthreaded projector. (The brightness is reduced to only 1½ or 2 footlamberts as an overall average by the film when pictures are projected.)

Taking 0.8 as the reflectance of the screen, the intensity of the projected light at the screen (projector running, but without film) must be 18.75 foot-candles in order to provide a brightness of 15 footlamberts. The amount of luminous flux pouring from the projection lens depends, of course, on the area of the screen. In the case of a screen 20 by 15 feet illuminated by 18.75 foot-candles, 5,625 lumens of light flow from the lens, regardless of the length of throw.

15-Footlambert Standard

If screen brightness be below 15 footlamberts, the darker gray tones in the picture will all be black, and hence become indistinguishable from one another. This means that pictorial detail in the shadows will be lost in murky gloom. Not only this, but the highlights will lack crisp brilliance. Any picture not adequately illuminated looks very insipid and induces eye-strain. The public has become so accustomed to extra-bright Tv images

(*Continued on page* 30)

HOW CONVERGENCE MAKES OBJECTS 'LEAP' FROM SCREEN

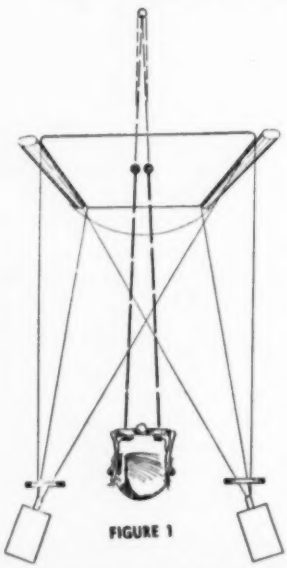


FIGURE 1

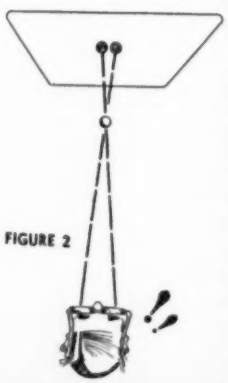


FIGURE 2

For those who may wonder just how 3-D cameramen obtain the startling effect that make objects seem to jump out of the screen and land practically in the viewer's lap, the accompanying drawings offer an explanation. In the 3-D "House of Wax" now playing around the country, there is a sequence where a sideshow barker bats a rubber ball attached to an elastic in such a way that it appears to leave the screen and almost knock the Polaroid glasses off the audience. In Fig. 1 we see that the left and right stereo images are placed on the screen in such a way that the viewer's eyes interpret them as a single image far behind the screen. The "leaping out" effect in Fig. 2 is obtained by converging the camera lens at a point much closer to the viewer than the objects on the same plane as the screen, with left and right images crossing over each other on the screen. While its shock value makes quite an impression on the audience, this effect must be used sparingly because of the eyestrain it can cause when misused.

Now Available

VERSATILE RCA SOUND HEAD

adaptable for magnetic—photographic—standard

To keep pace with today's new methods in sound presentation, RCA engineers have designed a sound head so versatile it can be adapted for use with virtually all currently proposed sound-on-film techniques.

With this latest sound head, you'll be ready to show, to their best advantage, the finest of the new film attractions whether they be 3-D, or standard; stereophonic, or single-track film. Yes, if you buy RCA's latest sound head, you will be prepared, through an equipment adaptation, to provide your patrons with quality sound reproduction for any of these film recording methods:

- **3-D conventional photographic sound track**
- **3-D stereophonic triple magnetic sound track**
- **2-D conventional photographic sound track**
- **Sound effects track**

Best of all, you'll be getting a sound head designed for rugged day-in and day-out theatre operation. You'll be assured of true equipment economy—long life with negligible maintenance expense and readily available replacement parts when necessary. Furthermore, you can arrange for dependable service from the RCA Service Company. Make sure your show has uninterrupted sound—protect yourself by buying the latest RCA sound head.

• • •

Ask your RCA Dealer also about the new theatre sound system RCA is readying for the latest film techniques—brilliant, new speakers, new amplifiers of greatly advanced design, powerful auditorium speaker units.

HERE'S NEWS FOR USERS OF LATE-MODEL RCA SOUND HEADS

RCA is now making available in kit form the apparatus which will enable you to convert your late-model RCA sound head right on the spot. Your RCA Dealer can tell you about fast, low-cost conversion.

KEEP IN TOUCH WITH YOUR RCA DEALER FOR FURTHER DEVELOPMENTS IN RCA SOUND

A new era in fidelity and versatility in sound is on its way from RCA. Keep in touch with your RCA Dealer for information on availability.

RCA®

THEATRE EQUIPMENT

RADIO CORPORATION of AMERICA

ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N.J.

In Canada: R C A VICTOR Company Limited, Montreal

The 'Hypergonar' Lens Process

Here in his own words Prof. Henri Chretien explains his "Hypergonar" lens process which is used for both the taking and the projection of 20th Century-Fox's CinemaScope system of wide-screen pictures, as culled from a paper he delivered before the Congress Technique International (Paris) in Sept. 1951.

THE NORMAL field of natural vision is much more extended in width than in height; this follows because the visual field of the two eyes are co-extensive one with the other.

This is fortunately compatible with the most common aspect ratio of objects which we see; the enlarged scope of landscapes in a vertical direction is more rare, and the head movements in the vertical direction are less spontaneous than the horizontal movements.

Compromise Aspect Ratio

Ever since the beginning of motion pictures the aspect ratio of the screen has been a compromise between these two directions. For ordinary photography where one can, by convenient arrangement of the apparatus on its support, take pictures whether it be in height or in width, the manufacturers have been constrained to adopt as format for the plates a ratio which is unchanged when one cuts the plate in half; theoretically this ratio will be the square root of 2 x 1, or 14 x 10, which is closely enough approximated by the succession of sizes 18 x 24, 13 x 18, 9 x 12, 6½ x 9, 4½ x 6, *etc.*

Panoramic Photography

Besides the aspect ratio framing the pictures there is still posed the question of field of view.

Eastman Kodak Co. has put at the disposal of amateurs apparatus which realizes this process. As to field of vision, the value of 150° is attained. In these cameras the film unrolls and rolls back in a narrow plane in proportion to the rotation of the objective.

Somewhere else it has been tried to record panoramas with ordinary cameras with flat plates by displacing the camera in a discontinuous manner and by changing the plate with each displacement.

This process has the inconvenience of presenting a polygonal panoramic field. The scale of the images changes periodically between each setover, at the center of the plate and the edge. Nevertheless, if the consecutive fields are well joined, one obtains panoramas of the most beautiful effect.

Projection Difficulties

In projection, the joining of the successive panorama fragments offers some difficulties. First, it is necessary that the light intensity be the same, and stays the same, during the course of projecting, which is hard enough to attain. Furthermore, it is necessary to watch constantly over the accurate joining of the images which is liable to be destroyed by the effects of temperature in the projectors.

One may minimize these two defects, or at least one may take the opportunity to modify the edges of the fields for the purpose of correction, without discomfort to the spectators, by letting them encroach one upon the other, the parts common to the successive fields being toned down toward their border in such a way that the total light across the two superimposed marginal regions stays constant.

The Hypergonar Process

What does a photographer do when he wishes to include a larger field of view in his plate? He chooses a shorter focal length objective, but then he encumbers his field in the dimension *of height* with a larger expanse of sky or of foreground.

The ideal solution would be to have an objective of which the focal length would be for example half the focal length in the horizontal direction as in the vertical direction, or *vice versa*. This solution would appear to be, *a priori*, a geometric impossibility. Let us examine, however, all the implications. The images which would be produced by such an objective would be anamorphosed reproduction of the object with two different dimensional scales, one for the height, one for width.

Here let us recall the mirrors which we see in the amusement parks where our own reflection is foreshortened or lengthened according to the direction of the mirror curvature.

Restoration of Image

The procedure proposed here is of the same kind. We can see immediately the advantages of recording on film under conditions of their restoration on the screen such images extended in width or even in height.

But is it possible to build efficiently optical equipment corresponding to this program?

In deforming mirrors the useful opening of the viewing instrument, which is the pupil of the eye, is only a few millimeters, which makes the image quality that these mirrors give seem of sufficiently good quality. But if one wanted to photograph them with lenses of large opening such as are required for motion picture photography, we would see that they are subject to all sorts of intolerable defects, particularly astigmatism.

It is thus necessary to study special optical systems in order to achieve the precision required by images capable of the enormous enlargement on motion picture screens. . . .

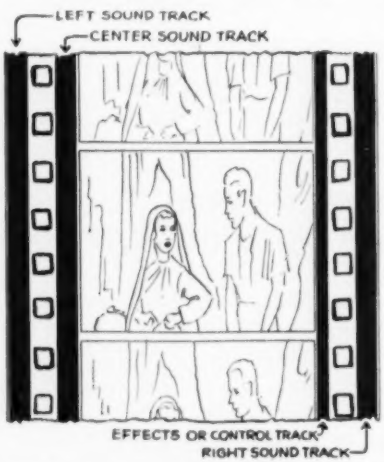
Theory of the Hypergonar

All the difficulty stems from the fact that, by necessity, in order to obtain real images we must introduce into the system at least one cylindrical lens crossed with respect to the others from which there results in the abberrations formulary very important terms of the second order which cannot be compensated.

The only method of escape then is the following: to employ only cylindrical lenses whose generatrices are all parallel. [*Generatrices*: line points or figures which generate or produce other figures by their motion.]

But then we must renounce the ability to obtain real images. As the light rays are propagated in the plane passing through the generatrices are not deviated (except a fraction of the thickness of the lenses), the rays emanate from the same object point which are propagated ac-

THIS WE'LL HAVE TO SEE



20th-Century Fox purposes taking these tracks off by means of a magnetic reproducing head. When they have accomplished this feat (including wear on the film itself and the reproducing head), many ears will be flapping to hear how it will be done.

cording to an orthogonal plot which also commences on the point object itself.

There remains, then, in order to record it on the photographic film only that the image be made real by means of an ordinary objective placed at the point of the virtual image, that is to say, at the same distance as the object.

Such is the principle on which rests the Hypergonar.

Description of the Hypergonar

Hypergonars are of two types: for picture taking, and for projection. They differ only in their dimensions and their mountings.

From the optical point of view, they consist of two separately achromatized systems: a converging system consisting of two lenses, cemented together, and a diverging system consisting of three lenses, cemented together.

In the case of taking pictures, focusing is accomplished in accordance with the distance of the subject, by means of a spiral shaped shaft and the help of a distance calibration. This does not alter in the least bit focusing of the camera: one may thus go immediately from taking ordinary pictures to taking panoramic pictures, and *vice versa*.

Projection With Hypergonars

In the case of projection, the Hypergonar is adjusted once and for all in accordance with the distance of the screen, by means of a helical rack and pinion. One projects on the screen a checkerboard pattern formed by white arrows on a black background, vertical and horizontal. One focuses with the projector objective. One inserts the Hypergonar and turns it in such a way as to restore the lines of the checkerboard to the vertical and to the horizontal, respectively. The horizontal lines have retained their fineness.

By turning the pinion of the focusing device of the Hypergonar, one brings the verticals into maximum clearness. The apparatus is adjusted. It has to be stated that the interposition of the Hypergonar does not modify the definition on the screen.

[ED.'s NOTE: It would seem that the SMPTE test reels would serve admirably this purpose.]

Light Losses?

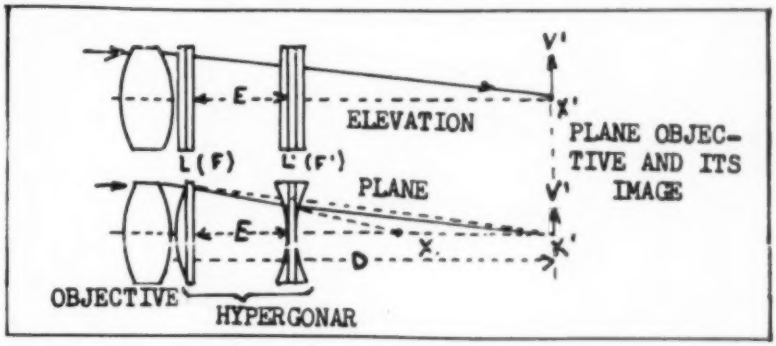
The loss of light occasioned by the introduction of the anamorphic attachments is insignificant: it is the consecutive interposition of only two supplementary lenses, as each of the two systems of which Hypergonar consists is formed by cemented lenses. In addition, the exterior surfaces of each system are treated with anti-reflection coatings.

The exposure time is thus not changed in the camera.

In projection, the screen brightness is reduced proportionately to the enlargement of the anamorphic attachment, since one lights a larger surface, and not in proportion to its square (as it would be the case if the image were enlarged in *all* directions).

The effect is the same way in regard to the grain of the film, and this advantage is very appreciable.

Sidelights on the Hypergonar Lens



Line drawing reproduction of the Hypergonar lens as presented in *La Technique Cinematographique*. IP's conception of this drawing was submitted to an outstanding authority in the optical arts who offered the following commentary.

ABOVE is a simplified drawing from the French publication, *La Technique Cinematographique* that shows the principle of the Hypergonar lens used in the CinemaScope process. The top figure shows the lens as viewed from the side, while the bottom figure shows the same lens as viewed from above or below.

The diagram illustrates a system made up of three lenses, a standard objective lens backed by two other lenses, each of the latter two made up of a number of cemented segments that embody the Hypergonar principle. Although in actual practice the camera and projection lenses are slightly different, we can assume for the sake of discussion that the lens system in the drawing can be used for both purposes.

Viewed from the side, as in the top drawing, we see that the two lenses made up of cemented segments appear flat and do not refract or change the direction of the light rays on the vertical or up-and-down plane after they have passed through the standard objective. Therefore, if the lens is used in a camera, there is no distortion in the elevation of the image when it reaches the film.

How Image Is Compressed

When we view the cemented segments from above or below, as in the bottom

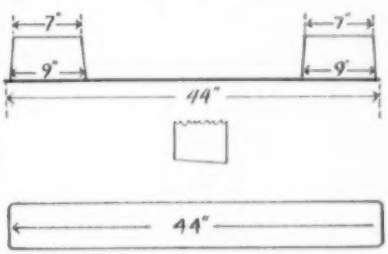
(*Continued on page 29*)

LARGE REEL REWIND SETUP

A bracket arrangement for extending present film rewind equipment to accommodate the new 24-inch reels is offered for consideration. For rewind standards 8 inches high, brackets 5 inches in height are constructed to give a total clearance of 13 inches, which is adequate to handle a 25-inch reel. If rewind standards of different length are used, the height of the brackets is varied accordingly. The brackets are welded to a plate 44 inches long and 4 inches high of ¼th inch cold rolled steel stock and afterwards dressed to neatness on an emery wheel.

The plate is fastened to the rewind table or bench by four ¼th inch roundhead stove bolts, two at each end near the edges, and one flathead ¼th inch stove bolt, countersunk, in the center of the plate.

In mounting the rewind standards on these extensions, the spindles face inward, and the rewind mountings must be cut an amount necessary to allow clearance. An adjustment of ⅜ths inches was found to be enough.—HAROLD B. HOBB, Sec., Local 761, Escondido, Calif.

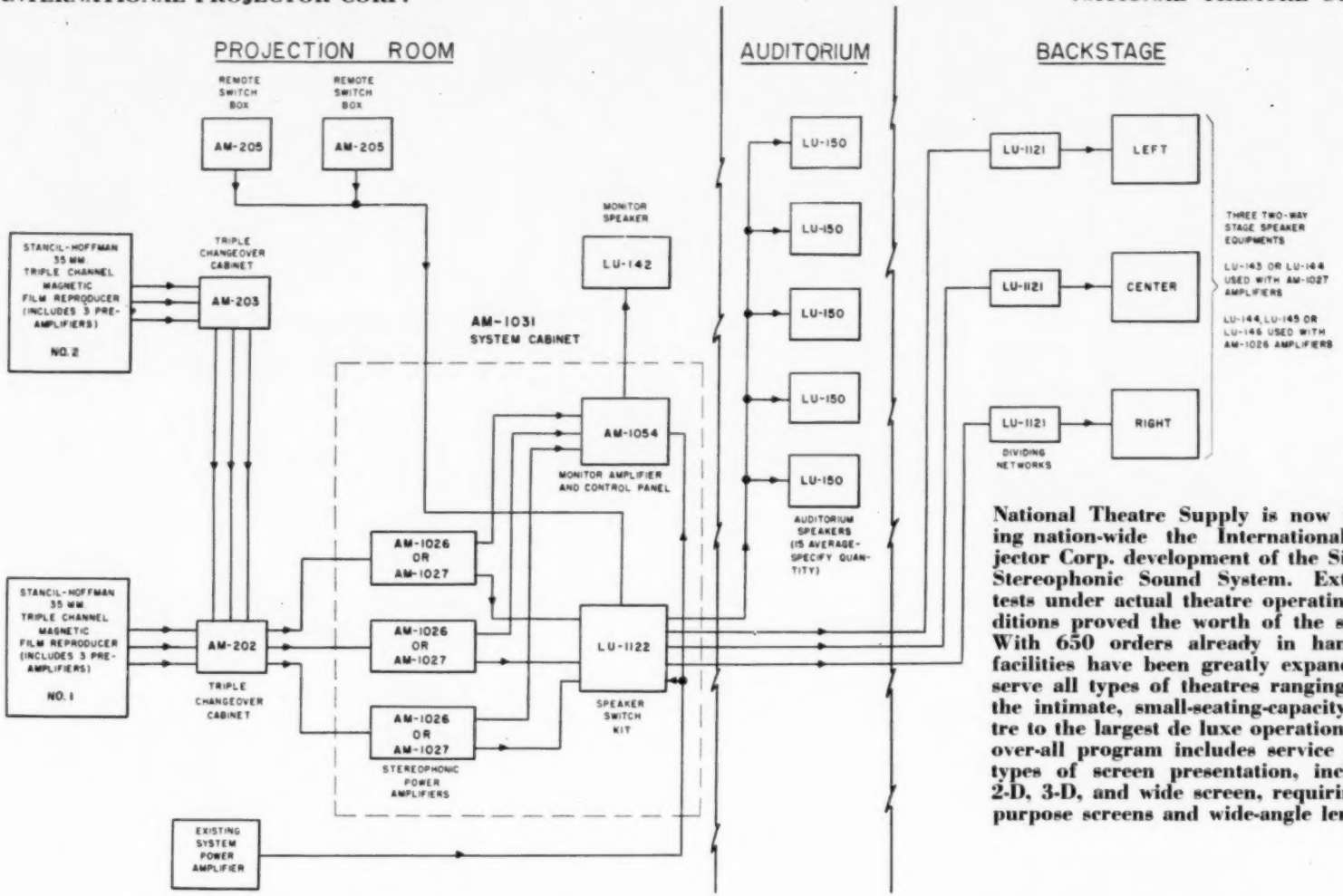


Height of the brackets is determined by the type of rewind used. Center view shows an end view of bracket. The brackets are bevelled ¼ inch on edge joining the plate, to give proper angle and clearance.

The plate (lower) upon which the brackets are mounted is made of ¼-inch cold-rolled stock, 4 inches wide.

SIMPLEX STEREOPHONIC THEATRE SOUND SYSTEM

INTERNATIONAL PROJECTOR CORP. **NATIONAL THEATRE SUPPLY**



National Theatre Supply is now installing nation-wide the International Projector Corp. development of the Simplex Stereophonic Sound System. Extensive tests under actual theatre operating conditions proved the worth of the system. With 650 orders already in hand, all facilities have been greatly expanded to serve all types of theatres ranging from the intimate, small-seating-capacity theatre to the largest de luxe operations. The over-all program includes service on all types of screen presentation, including 2-D, 3-D, and wide screen, requiring all-purpose screens and wide-angle lenses.

Sound System Hook-Up Between Projection Room, Auditorium and Backstage Loudspeakers

3-CHANNEL MAGNETIC REPRODUCER

CAPACITY: 5,000 feet of 35-mm magnetic film.
SPEED: 96 perforations per second.
DRIVE: 2-pole, 1,440 rpm interlock motor.
OUTPUT: from 3 pre-amplifiers, 6 milliwatts into 500 ohms.

AM-202, 3-CHANNEL CHANGEOVER AND WARPING CABINET

VOLUME CONTROL: 3-gang with range of from 0

AM-1054 MONITOR AMPLIFIER AND CONTROL PANEL

SELECTOR SWITCH: provides for individual monitoring of 4 channels, or for channel Nos. 1, 2 and 3 simultaneously.
VOLUME CONTROL: for adjustment of level in projection room.
JACK: for power amplifier test and measurements.
POWER SUPPLY: self-contained.

CONTAINS: two pushbuttons and two indicator lights for remote operation of "Stereo" and "Regular" speaker switch LU-1122.

LU-142 MONITOR SPEAKER

DIAMETER: 8 inches; IMPEDANCE: 8 ohms.

LU-150 AUDITORIUM SPEAKER

DIAMETER: 12 inches; IMPEDANCE: 8 ohms, furnished with 70-volt, line-matching transformer with taps for level adjustment.

LU-1122 SPEAKER SWITCH

LU-1121 SPEAKER NETWORK

VOLUME CONTROL: 3-gang with range of from 0 to 38 db., and off in 20 2-db. steps.
CHANGEOVER SWITCH: provides for continuous stereo sound, with addition of second reproducer.
WARPING: resistance-capacitor network for variable high-frequency roll-off to suit theatre acoustics.

AM-1026 POWER AMPLIFIER

INPUT: 500 ohms (bridging); —20 db., reference 6 milliwatts.
OUTPUT: 8, 16 and 32 ohms; 75 watts.

AM-1027 POWER AMPLIFIER

INPUT: 500 ohms (bridging); —20 db., reference 6 milliwatts.
OUTPUT: 8 and 16 ohms; 25 watts.

LU-1122 SPEAKER SWITCH

REMOTE OPERATION: heavy-duty latching relay, 6 volts A.C. impulse-energized.
"STEREO" POSITION: Nos. 1, 2 and 3 power amplifiers to the left, the center and the right stage speakers; existing system power amplifier to the auditorium speakers.
"REGULAR" POSITION: Nos. 1, 2 and 3 power amplifiers to the load resistors; existing system power amplifier to center stage speaker.
DISTRIBUTION TRANSFORMER: included for 70-volt line distribution to auditorium speakers.

AM-205 REMOTE SWITCH BOX

LOCATION: at operating positions adjacent to existing sound changeover switches.

LU-1121 SPEAKER NETWORK

LOCATION: mounts on low-frequency stage speaker horn stand.
CONTAINS: frequency dividing network for matching power amplifier(s) to any combination of stage speakers.

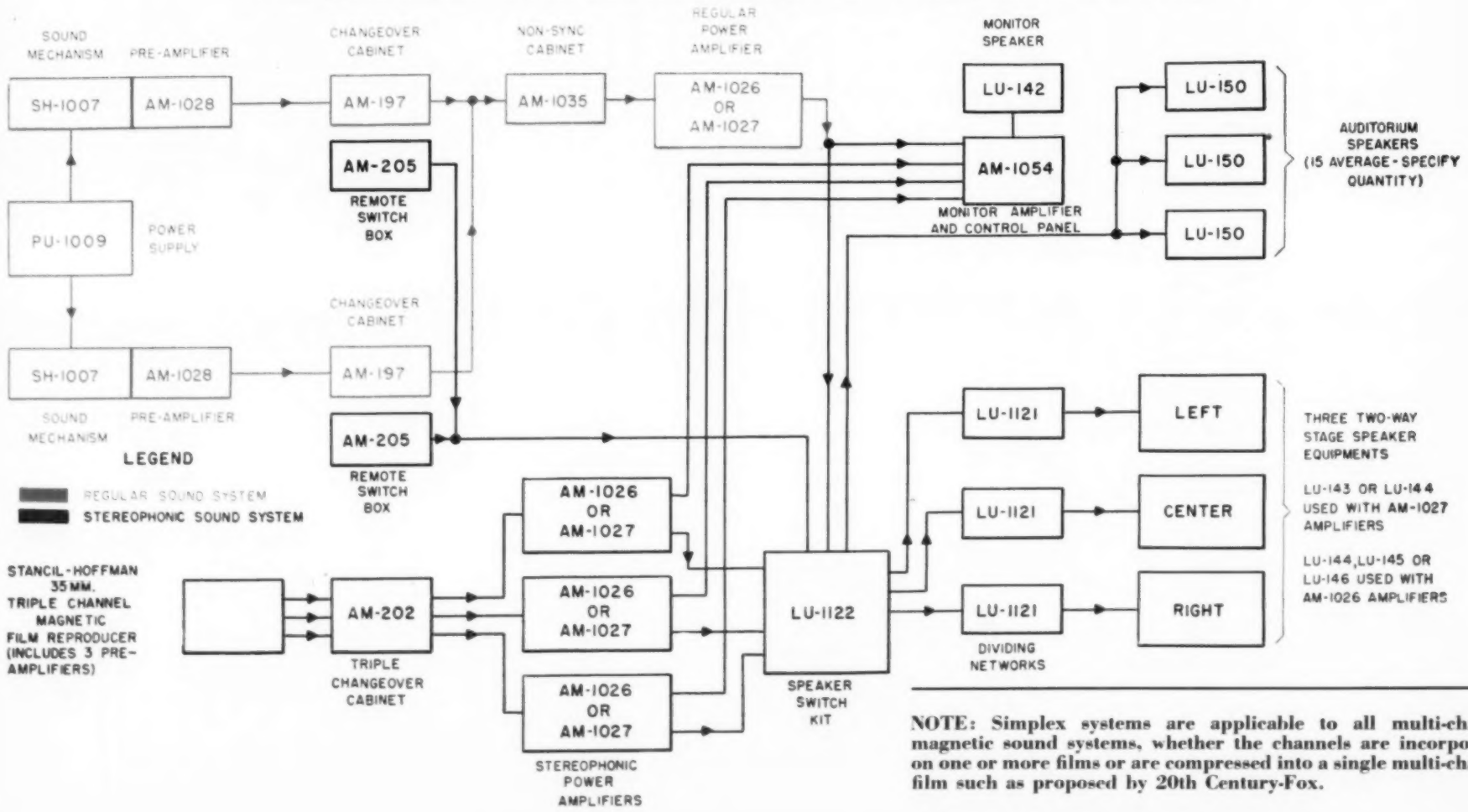
SIMPLEX THEATRE SPEAKERS

LU-143: 1 high-frequency and 1 low-frequency unit.
LU-144: 1 high-frequency and 2 low-frequency units.
LU-145: 2 high-frequency and 2 low-frequency units.
LU-146: 2 high-frequency and 4 low-frequency units.

AM-1031 SYSTEM CABINET

CONTAINS: 3 AM-1026 or AM-1027 power amplifiers; monitor amplifier and control panel; 1 AM-1054 speaker switch; 1 LU-1122.

Showing the Interconnection Between the Regular and Stereophonic Sound Systems



NOTE: Simplex systems are applicable to all multi-channel magnetic sound systems, whether the channels are incorporated on one or more films or are compressed into a single multi-channel film such as proposed by 20th Century-Fox.

IN THE

SPOTLIGHT

CONFIRMATION of the settlement of the long-standing dispute about wages and working conditions between Cinerama, Inc. and IA Local 110, Chicago, was forthcoming recently from Cinerama officials. The long-drawn-out negotiations terminated when Cinerama signed a contract which acceded to Local 110's original proposals. The outcome of these negotiations is a tribute to the steadfast resolution of Local 110, as sparked by business manager, Eugene Atkinson, who insisted that Labor should and will participate in any and all benefits stemming from the development of new technological processes.

• Eugene Atkinson, Bus. Rep., Chicago Local 110 •

IP salutes Local 110 for effectuating those policies which IP has long advocated—full participation for Labor in any management gains resulting from technological advances.

• New York Local 306 officials concluded extended negotiations with the New York metropolitan (Loew and RKO) and first-run Broadway houses with a new two-year pact based on an overall 10% increase for the union membership, 8% of which is a direct wage boost, and 2% is added to the Local's employer-participation welfare plan. The new contract became effective June 1 this year and is retroactive to September 1952, when the previous contract expired. Now that Local 306 has pacted the top exhibitor groups, it is expected that the other New York theatre circuits will follow the pattern established with the Loew & RKO houses.

• Local 843, Las Cruces, New Mexico, celebrated its first anniversary on May 20 last at a dinner-dance held at Vonnie Lee's a popular resort in those parts. Among the out-of-town guests were IA Representative E. J. Miller, of Houston Local 279; E. Earhart, El Paso Local 153, and Meyer Moscow, New York Local 306.

The Las Cruces Local has the distinction of being the only projectionist's organization affiliated with the New Mexico State Federation of Labor.

• Lester B. Isaac, for many years director of visual and sound projection for Loew's, Inc., has been appointed director of exhibition for Cinerama, Inc.

• Various new presentation processes, including all 3-D and wide-screen processes to date, were subjected to extensive discussion and intensive study, supplemented by actual demonstrations, during the joint two-day meeting last month of California District Council No. 2 and of IA District No. 2 (the latter organization includes the states of Arizona and Nevada).

Under the chairmanship of Merle Chamberlin, projection chief at M-G-M Studios, the delegates first went to the Hollywood Cinerama Theatre where the Cinerama process was viewed and discussed. Then the scene shifted to the M-G-M Studios, where lunch was served on Stage 16 and several new 3-D and wide-screen pictures were shown, including shots from "Young Bess," "Take the High Ground," "Fort Bravo," and "Kiss Me Kate." Universal showed scenes from "It Came From Outer Space"; Warner Bros. exhibited scenes from "Charge at Feather River", and Walt Disney offered scenes from his first 3-D cartoon "Melody."

Equipment and processes were the only topics considered at the sessions, there being no discussion of wages and manpower.

A number of important industry personalities attended the various sessions, including IA President Richard F. Walsh; Dore Schary, production chief, and L. K. Sidney of M-G-M Studios; Loren Ryder, technical director for Paramount; IA representatives Roy Brewer, Steve Newman, and Carl Cooper. Also present at the sessions were three leading members of the Mexican film industry: Ishmael Rodiquez, producer-director; Luis Sanchez Tello, Mexican Film Technicians Union, and Jose Carlos, sound engineer.

Loren Ryder told the delegates that if he were a theatre owner he would first of all equip his theatre with as large and as wide a screen as possible. "Then," he continued, "I would be ready to offer pictures in any wide-screen ratio and still be able to present past product." (IP has been harping on this course for months.)

Richly merited praise was ladled out to Merle Chamberlin for his swell handling of the difficult arrangements job. Unanimous opinion of all delegates was that the sessions were highly successful, and that similar meetings could be held all over the country with great benefit to all IA units. The boys were wondering not a little why they never thought of such a program long 'ere now on other technical developments within the industry.

• An exchange of correspondence with an American "projection pen pal" is sought by one of our foreign subscribers, Mr. Tomezo Totsu, 7 Suwagawara, Ronakano, Hachinohe-City, Aomori-pref., Japan. Mr. Totsue has sent this publication some very interesting notes on projection in Japan which we plan to print in a subsequent issue, and he is most anxious to communicate with projectionists in our part of the world.

• Prentiss E. Flowers, charter member and former business representative of Local 400, Alexandria, La., is recuperating at home after spending several months at a local hospital where he underwent treatment for a complication of ailments.

• The Missouri State Organization, IATSE, held its semi-annual meeting on May 17 last at the Colonial Hotel in Springfield, Mo. Springfield Locals

137 and 447 were hosts at a luncheon given in honor of the delegates and visitors to the meeting. N. Dudley McCann, secretary of Local 447, was chairman in charge of all arrangements for the one-day conference.

Highlights of the meeting were addresses by IA Representative Felix Snow of Kansas City, and LeRoy Upton, 9th District secretary and secretary of St. Louis Local 143. Harvard O'Laughlin, Local 143 business representative, also addressed the gathering and told of the new projection processes he witnessed on his recent trip East.

The meeting closed with an election of officers. Hugh James, Sedalia Local 135, was re-elected president of the State organization, and O'Laughlin was re-elected secretary-treasurer.

• We were sorry to learn that Roger M. Kennedy, 3rd IA vice-president and business representative for Detroit Local 199, has had a recurrence of his eye ailment.

• Perry L. Carter, president of Cleveland Local 160, was elected business representative, succeeding Harland Holmden, who was recently appointed assistant IA president. Upon his election, Perry resigned from the presidency.

• Realizing that coming events cast their shadows before them, Local 400, Alexandria, La., pulled off a smart bit of showmanship at a recent civic parade in that city. The parade had 65 floats and ran for one hour and 15 minutes, so these enterprising Local 400 guys used a Strong Trouper spotlight and theirs was the only float in the parade that was spotlighted. As we all know, a Strong Trouper spotlight carbon trim burns for one hour and 20 minutes, thus giving the plotters five minutes leeway—if all went well—which it did.

The Local 400 men (behind the backs of other participants) quietly promoted a portable (two-men carry) electric light plant from the city fire department. This plant was placed in the rear of a station wagon, to which was attached a trailer. The lighting plant was bolted to the floor of the trailer in order to provide a steady light and to give the operative boys something to hold on to. Being conservative, the IA boys used only *nine* different colors to light their float, and the effect was merely kaleidoscopic.

This striking lighting job elicited praise from two radio stations and in the local press. Score a clean beat for Local 400's showmanship. Among the conspirators were W. Martin Lipscomb, business representative, who operated the spot; J. Earle Dupress, driver of the station wagon, and M. J. Angorola, who was in charge of the portable light plant.

• The recent testimonial dinner-dance tendered Local 306 old-timers Mike Berkowitz, Harry Mackler, and Joe Abrams was a gala affair attended by projection notables from many IA Locals throughout the state. The affair was sponsored by a group of friends of the trio, and was a tribute to their popularity in projection circles. Gold retirement cards were presented to Berkowitz, Mackler and Abrams, the awards being made by Harland Holmden, IA assistant president; Herman Gelber, president of New York Local 306, and Robert Goldblatt, honorary member of the 25-30 Club.

Among those present were Adm. Rutledge Tompkins and Arthur Meyer, representing International Projector Corp.; Allen G. Smith, New York branch manager for National Theatre Supply Co.; Paul Ries of National Carbon Co.; Charlie Muller, chief projectionist, Radio City Music Hall; Charles Kellner and Mike Springer, RCA Preview Theatre; and many other well-known local projection personalities. From out-of-town came Larry Sherman, Syracuse Local 376; Roy Fisher, Rochester Local 253; Albert DeTitta, Tom Neathery, Tony Boscarelli, and Ed Daugherty, Hudson County (N. J Local 384. Representing New York City Locals were Solly Pernick and Arthur Yeager, No. 1; Steve D'Inzillo, Ernie Lang, Harry Garfman, Izzy Schwartz, Irving Merker, Izzy Sherman, John Krulish, and many others too numerous to mention here, from No. 306.

Abraham Kessler and Jacob S. Winick, chairman and co-chairman, respectively, of the arrangements committee, were commended by those present at the affair for the swell job they did in making this a long-to-be remembered party.

• Last month it was announced that a major Tv chain was "quietly switching over to all-live Tv and eliminating

CINEMASCOPE PREMIER IN BOSTON

Paul Brown and Harold Sheerer, members of Boston Local 182, are shown in the projection room of the Metropolitan Theatre in that city on the occasion of the premiere showing of 20th-Fox's CinemaScope process for area exhibitors. The projectors were Simplex, the lamps National Excelite, which projected a picture to a screen 48 feet wide by 19½ feet high.

LOCAL 447, SPRINGFIELD, MO. HOLDS 37TH ANNIVERSARY CELEBRATION

Pictured above is a group of Projectionists Local 447 members as they gathered at a breakfast party commemorating the Local's 37th anniversary. Shown seated, left to right: L. E. Glennon, business representative; N. Dudley McCann, secretary-treasurer; Carl Amsler, vice-president; I. H. McArron, president; A. C. Whittaker, trustee, and Max Weaver, sergeant-at-arms. Standing, left to right: Evert Baty, Elmer Nuttelmann, Jess Tuckness; O. K. Southwick, trustee, and Martin Kirchner, executive board member.

film." Despite this rumor, Hollywood last month had more television films in production than in any previous month, according to the current (May) issue of *American Cinematographer*. Today there are more than 110 Tv film series available for local and regional sponsorship.

Most of these films are currently being televised by the majority of the nation's Tv stations. Several new series are in the planning stage or are about to go before the camera. This activity means that more and more cinematographers will be recruited from among ranks of studio cameramen to photograph these television film programs. Last month, an average of 33 cinematographers was engaged weekly in directing the photography of Tv films in Hollywood.

• The annual spring meeting of the N. Y. State Association of Motion Picture Projectionists was held last month in Middletown, N. Y. Middletown Local 311 tendered a luncheon for the delegates and guests, after which the meeting was called to order and the business of the day discussed.

Of particular interest in the discussions were 3-D and wide-screen projection and the effects of these processes on the status of the projectionist. Edward E. Wendt, business representative for Albany Local 324, proposed that all Local members of the Association write to the International Office suggesting a policy of at least a 10% increase in wages for all projectionists working with these processes. The motion was seconded by Allen J. Tindal, business representative of Rochester Local 253, and passed by the body.

A message from IP's Jim Finn in which he lauded the craft for its importance to the success of any motion picture showing, was warmly received and the delegates present went on record endorsing IP as a staunch supporter of craft welfare and suggesting that all IA Locals subscribe their memberships 100% to the publication. (Thank you, gentlemen.)

The meeting closed with a midnight banquet celebrating the 31st anniversary of Middletown Local 311. All delegates and guests attending the Association meeting took part in the festivities.

• Alertness and fast work by two members of Local 299, Winnipeg, Canada—Jimmy Biggerstaff and Joe Chess of the Garrick Theatre—saved a showing of "Bwana Devil" from flopping over a large area of Canada. One 1200-foot section of the picture gave not a 3-D effect but merely a blurred image and terrific eyestrain. Somewhere along the production, editing or exchange trail the right-eye and left-eye strips got on the wrong reels. Thinking fast, the Local 299 men switched the porthole filters, thus correcting the trouble, and then later they made the proper reel switch.

Frantic phoning to other showing centers disclosed the same "bull," with the same corrective measures being applied. So projection is purely a mechanical process, eh?

25 Years Ago—June 1928

• The General Executive Board met at the Tuller Hotel, Detroit, Mich. Among the appeals heard was that of Edward H. Kuhn, member of Local 221, Aurora, Ill., who appealed the action of the General Office in ordering his name stricken from the membership roll of the Local on the ground that his admission to membership was irregular. The Board unanimously concurred with the action of the General Office. . . . The General Executive Board unanimously concurred with the recommendation of the Finance Committee to increase the per capita tax to 90c. . . . The Board unanimously endorsed an appeal for financial assistance for the New Bedford (Mass.) Textile workers who were out on strike against a 10% reduction in wages. Local Unions were requested to forward all contributions to the General Office, who referred all such donations to the proper committees. . . . Charter installed for Local 656, El Centro, Calif. . . . Leavenworth, Kans., formerly in the jurisdiction of Kansas City, Mo., was granted a charter as Local 657. . . . Local 654, Minot, N. Dak. held its first annual dance.

OBITUARIES

JAMES J. HAMILTON, 65, charter member of Washington Local 224, died recently after an illness of several months. He served Local 224 in various official capacities and enjoyed the high regard of the entire membership. Hamilton joined the Local in 1911 and worked for many years at the Warner Bros. Uptown Theatre until he became ill. From 1918 to 1940 he was a District electrical inspector, and in subsequent years, in addition to working in various theatres, he was often called upon to run pictures at private showings. He is survived by his widow and three daughters, all of Washington, D. C.

WALTER S. CROFT, Sr., 64, former business representative for Local 170, Kansas City, Mo. died last month at St. Mary's Hospital in Kansas City. Walter Croft joined Local 170 back in 1910, and served as business representative from 1927 to 1931 when IA President William F. Canavan appointed him an International representative. He served as an International representative under Presidents Canavan and Wm. C. Elliott. Croft later returned to Kansas City and in 1939 he was again elected business representative, holding that office until January of this year.

Croft had been in ill health for about a year and a half prior to his death, and when his official term expired January 1953 he refused to seek re-election. His passing was mourned by his many friends in the IA.

IRA E. DIETZ, 73, member of Local 79, Massillon, Ohio, died recently. He was active in labor circles in Ohio and at one time served as president of the AFL trades and labor assembly.

Motiograph 3-D Magazines

Motiograph now has available 25-inch magazines to accommodate the oversize 24-inch reels needed for the showing of 3-D films with one intermission.

The magazines are constructed of 18-gauge steel (0.049 inches thick) and are 3⅞ inches wide, instead of the usual 3-inch width of the standard 18-inch magazines. The cast brass hinges and aluminum supporting spiders are specially designed to provide extra strength in the larger units.

The upper magazine has a fully-enclosed adjustable reel shaft tension device that can be locked permanently into the correct position. The takeup is enclosed in a cast aluminum housing with tension supplied by aluminum and cork friction discs and ball bearings.

To provide for any change in the standard diameter of the reel shafts from the present 5/16ths of an inch to ½ inch in diameter, the new magazines are designed to accept either size shaft.

Prediction of Electrical Failures†

It is now possible to build electronic equipment in such a way that most failures in performance can be predicted in advance and therefore prevented, this startling article reveals. Reliability of electronic units would be greatly increased if such designs were to be incorporated into future models.

UTILIZING a relatively unexplored approach to the problem of higher reliability of electronic equipment, the National Bureau of Standards is investigating the feasibility of detecting incipient failures long before they perceptibly affect overall performance. The study has as its goal quick and easy failure-prediction checks by unskilled personnel. It is being conducted under the sponsorship of the Office of Naval Research by J. H. Muncy of the NBS engineering electronics laboratory.

In this NBS technique a maintenance man simply plugs a portable failure-prediction unit into the equipment to be checked, and turns a multipoint selector switch. A red light flashes to identify stages or components that have deteriorated below safe levels and that have, therefore, become prospective causes of equipment failure.

In accelerated-aging experiments on military radio receivers the Bureau has succeeded in predicting a majority of failures many hours before they occurred.

How It Works

Either sudden or gradual failure of a tube or other component may cause failure of electronic equipment. Surveys have indicated that at least half of all equipment breakdowns are produced by *gradual* failures of components. The NBS work has been concerned with practical means of spotting these gradual failures before the device becomes inoperative.

In multi-stage equipment it is generally impossible to detect such incipient failures by input-output performance measurements, because the tolerance of an overall measurement will usually mask the performance decrease of one stage. Daily variations in measured gain of a typical piece of equipment are greater than the change caused by the gradual deterioration of one tube in one stage. As the tube continues to deteriorate, the time at which impairment of overall performance becomes detectable may virtually coincide with the time at which overall failure occurs. Successful failure prediction therefore requires that the condition of each important stage or small group of stages be established individually.

Failure Level Threshold

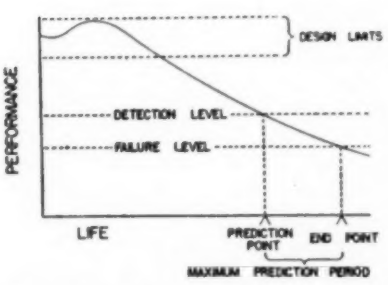
In equipment designed for reasonably long life a component can gradually deteriorate a great deal before it reaches the level of minimum acceptable performance (the failure level). It is the gradual nature of this deterioration that gives rise to the possibility of prediction of failures long in advance.

Tube failures constitute by far the most common cause of electronic equipment breakdown, and the experimental NBS failure-prediction system depends primarily on the sensing of decrease in tube transconductance of critical stages. But the test also permits detection of changes in components other than the tube, provided these are changes that affect the gain of the stage.

The test consists primarily of operating the tube as a resistance-coupled amplifier, with a 3,000-cycle signal, and sensing whether or not the voltage gain

(*Continued on page* 28)

† National Bureau of Standards.



Curve shows how performance of electronic component changes during service life. Performance of new item may vary between design limits; but as life increases it falls off, first to the detection level, then to the failure level. Somewhere between the detection and failure levels is the point at which the component should be replaced to forestall breakdown. The quick, semi-automatic checking routine described herein reports when that point has been reached.

To the Editor of IP:

Your magazine is eagerly looked forward to, especially with the introduction of the new 3-D techniques. The only details I have read about the new CinemaScope system are what have appeared in the non-trade press. However, I believe the local theatre managers are unhappy about the high cost of installing this system which has been quoted at about $20,000 for one theatre alone. The film, "Bwana Devil," has just commenced in Sydney, and another theatre there is showing "Metroscopics," which I am told is a re-issue of the pre-war "Audioscopicks."

Robert A. Mitchell's articles are also looked forward to; the latest on "Types of Theatre Reproducers," is the best I have seen on the subject. I could not say, however, that I have heard theatre sound reproduction to compare with the latest English l.p. discs when they are played over wide-range gear. So far, American long-playing records are not available here.

Your articles on black masking *vs.* illuminated screen surrounds are most interesting. Personally, I have always preferred the former, with correctly rounded corners, and wonder how a 3-D picture would look in the Schlanger set-up. Your articles on modern projector design are always appreciated. How about an article on the latest Ernemann projector which has been mentioned briefly in your columns?

J. D. N. Bliss
Townsville, Qld., Australia

To the Editor of IP:

I desire to sincerely thank you for your excellent publication and the very able manner in which we craftsmen are kept up to date by your various contributors. I have been operating since 1920, doing shows two nights weekly until 1933, and since then seven and eight shows weekly.

The greatest development, I think, since sound has been the introduction of safety film, even though there has been a continual "beef" against it in this country. The trouble chiefly has been the difficulty of making splices, but this has been a result of hand splicing which should have gone out years ago anyhow—a reliable splicer being the absolute answer.

Through your publication we are kept up to date in new developments, and are never at a loss to answer our employers or the public on new innovations, which knowledge is available only through IP. I keep a special book in which to index IP articles so that I can quickly refer to any article no matter how long ago it appeared.

Reg. A. Stewart
Wangaratta, Vic., Australia

3-D a Lumen-Eating Process

Filters, Specs Induce a 75% Light Loss Over-All

To the Editor of IP:

For the past few months I have been reading articles in IP concerning the projection of 3-D pictures. These articles said that the projection light would have to be at least 2 times as bright as the present light. When I found out that I was to run "Bwana Devil," I began to worry about how to get more light out of my present projection lamps. However, my worry was just a waste of time, because I used the same amount of light on "Bwana Devil" that I used on other pictures.

I got my extra brightness from the 3-D screen itself. Our regular screen was painted a half dull and half bright silver by Williams Screen Co. Some scenes in "Bwana Devil" were so bright that they hurt the eyes to look at it. I used 46 amperes for a 20-foot screen with a 110-foot throw.

I don't believe that projectionists need to worry about getting enough light for 3-D pictures. A good repaint job on the old screen or a new 3-D screen will do the job. If they want to increase it even more, they can try the new carbons.

LAWRENCE E. JOHNSON
Aggie Theatre, Stillwater, Oklahoma

THERE is no objection to resurfacing a regular matte screen with the aluminum coating necessary for 3-D projection, providing that three very stringent conditions are met: (1) The aluminum alloy paint must be of the proper type to provide a reasonable amount of light-diffusion, to provide high reflection of light, and to resist oxidation which dulls and discolors. (2) The metallic coating must be smoothly applied in 2 or 3 coats. (3) The screen must be free from wrinkles and stretched very tight.

Wrinkles in a "silver" screen are highly visible during projection because of the specular qualities of the metallic surface. The absolute necessity of having a perfectly flat 3-D screen cannot be overemphasized.

Controlling Light Factors

Regarding the excellent picture-brightness claimed by Mr. Johnson for showings of "Bwana Devil" at his theatre a few figures may be given based solely on arc-current and screen size. These figures, however, do not necessarily represent actual screen-brightness conditions at the Aggie Theatre, but they do represent prevailing conditions found by the writer in other theatres showing 3-D films, and hence may be of general interest.

Lamps, lenses, and screens—picture-brightness depends on all of them; and the importance of the projection lenses should not be overlooked. Because it is customary to replace old, uncoated F:2.5 lenses with modern, coated F:2.0 (or F:1.9) lenses for 3-D showings, I shall assume that Mr. Johnson is using the "faster" lenses.

According to data issued by National Carbon Co., a simplified high-intensity mirror-arc drawing 46 amperes (7-mm and 6-mm trim) furnishes approximately 9,450 screen lumens (one projector running, but without film). This is a lot of light; and since Mr. Johnson's 20-foot screen has an area of 300 square feet, illumination of his screen has an intensity of 31.5 foot-candles. With a white matte screen of 80% reflectivity he obtains a screen-brightness of 25.2 foot-lamberts, a very good light level indeed. With an aluminum screen, however, the light level varies somewhat as one views the screen from the middle or the side of the auditorium.

Theatre Viewing Angles

Aluminum screens are less "specular"—that is, more "diffusive"—than they used to be, and that is a good thing. If Mr. Johnson's screen has the properties of a new, factory-made aluminum screen, its average reflectivity as viewed from the extreme sides of the auditorium will be about 50%; while for a wide section through the middle of the theatre it will seem to reflect about twice the amount of light that falls upon it, that is, about 200%. By "robbing" extreme viewing angles of light, the silver screen actually furnishes to the middle of the auditorium about 2½ times more light than the best matte screen.

Well, with his aluminum screen Mr. Johnson is getting a brightness of about 15.75 foot-lamberts as viewed from the side seats, and 63 foot-lamberts as viewed from the middle seats. With ordinary "flat" films this results in a picture-brightness high enough to hurt the eyes, as Mr. Johnson says. But with 3-D, involving the use of Polaroid filters over the projector lenses *and* over the eyes of the patrons —2 thicknesses of Polaroid in all —the brightness takes a nosedive.

The use of two projectors running simultaneously *does not* double picture-brightness when the Polaroid glasses are worn! One eye sees only the light from one machine, and the other eye sees only the light from the other machine. Only when the patron removes his polarizing glasses (perhaps to see how queer the 3-D picture looks without them) is the brightness doubled. For the purpose of calculations, therefore, we need compute only the brightness obtained from one projector alone.

Light-Transmission Data

The polarizing filters are not efficient transmitters of light. We have heard it said that the viewing spectacles transmit as much as 80% of the light falling upon them; but this is not true, even though we wish it were. The writer has tested the Polaroid glasses and projection filters on a precision photometer and found that they transmit only 40% of the light falling upon them. Fully 60% of the light is wasted.

With two thicknesses of Polaroid—projection filter plus viewing spectacles —only 16% of the light gets through to the eyes of the patron, and 84% of the light is wasted! Subtract 84% of the light from a uniformly illuminated white surface, and the resulting color-tone is a light medium gray. Compared with conventional "flat" projection, 3-D projection is gray projection.

Whether we like it or not, 3-D is lumen-eating process, a light-wasting process; and the earlier reports on the efficiency of the process have often been inaccurate and misleading. It is a fact, and not hearsay or guesswork or second-hand information, that the Polaroid filters supplied for showings of "Bwana Devil" have a transmissivity of only 40%.

To return to the possible screen-brightness at the Aggie Theatre: when Polaroid filters are placed over the projection lenses, and *one* machine is run without film, and the illuminated aluminum screen viewed *without* Polaroid glasses, brightness is reduced

at the sides of the auditorium from 15.75 to 6.3 foot-lamberts, and is reduced in the middle of the auditorium from 63 to 25 foot-lamberts.

When the observer wears the Polaroid viewing glasses, and both projectors fitted with polarizing filters are run without film, side-seat brightness drops to only 2.52 foot-lamberts, and center-seat brightness to 10.08 foot-lamberts. The center brightness, which covers most of the auditorium if the theatre is long and comparatively narrow, is satisfactory for good viewing. 10 foot-lamberts is the minimum recommended brightness for projection.

Screen Contrast Values

Clearly, 10 foot-lamberts is not enough to "hurt the eyes," though it gives an excellent picture, with no loss of shadow detail. Only a few of the side seats "down front" will suffer from the 2½ foot-lambert level. Some idea of the brightness-difference between 10 and 2½ foot-lamberts can be gained if it be arbitrarily assumed that 10 foot-lamberts brightness represents standard "white." On this assumption, 2½ foot-lamberts brightness is light gray.

As I said at the outset, all of these screen-brightness figures should not be taken as an actual analysis of 3-D projection conditions at Mr. Johnson's theatre; but if they happen to be closely in line with what Mr. Johnson is getting, we can say that the 3-D presentations at the Aggie Theatre are of excellent quality.

ROBERT A. MITCHELL

Altec Increases Service Staff

A number of additions to Altec Service Corp.'s engineering and service staff have resulted from increasing orders for installation of the company's stereophonic sound system, according to a recent announcement by E. O. Wilschke, operating manager.

R. L. Simpson has joined the Newark, N. J. office, and H. G. Leedy and J. E. West now work out of the Southern division offices at Atlanta, Ga. C. S. Bacon and J. K. Sweeney are with the Central division in Chicago. Other new assignments include: E. R. Roach and J. L. Pyrtle to the Southwestern division office.

Gain in Kodak Profits, Sales

Net earnings of the Eastman Kodak Co. for the first quarter of 1953 were $9,916,028, up 14% from $8,697,477 in the first quarter of 1952. These earnings are equal to 59 cents a share on 16,555,254 common shares and compare with 52 cents a share in same period last year with 16,527,083 shares then outstanding.

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All This and Heaven Too?

FROM THE TRADE PRESS

DAVENPORT, Iowa — The single-film, single-projector 3-D color process developed by R. E. Schenstad was given its first public demonstration here before a group of local exhibitors and projectionists by the inventor and by the president of Stereocolor, Inc., Col. B. J. Palmer.

Schenstad has accomplished what he said his process will do: (1) provide stereo motion pictures taken by a single camera; (2) a single 3-D black-and-white film which projects the images in color; and (3) a single-projector 3-D mechanism.

WHEN "Stereocolor," purported to be a cheap and effective method of single-strip 3-D projection was demonstrated, IP's observer was on hand. His report follows:

"While some aspects of the system are interesting, our reaction was not favorable on the whole. Experienced principally as a photographer, Schenstad was seriously handicapped by what seemed to be a limited knowledge of professional theatre projection.

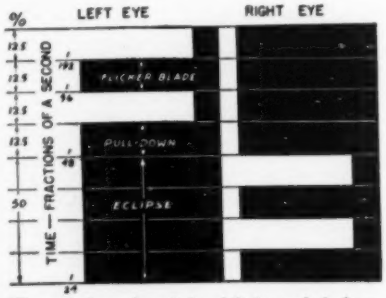
"Our impression is that this system could not be used in designing a 3-D attachment for existing projectors. *It would have to be a completely new unit.* And, although it produces a 3-D picture, it leaves unsolved present 3-D problems such as inadequate light and the need for Polaroid glasses.

Two Projectors in One

"The machine Schenstad used was constructed of parts from two ancient Holmes 16-mm projectors. Two projection movements and two lens units were mounted one above the other and connected to a common power supply. In the film train, 35-mm sprockets were used on all shafts. Schenstad's idea is that one 35-mm film strip could hold two 16-mm stereo images.

"One of the pictures, supplying the left-eye image to the screen, was projected by the upper intermittent movement. As the film passed the second intermittent movement, the picture beside it was projected, supplying the right-eye image to the screen.

"While the top movement had an open shutter blade, allowing the left-eye picture to reach the screen, the lower shutter blade was in closed position. Two light sources were therefore required. Schenstad attacked this problem by mounting two lamps in his projector, one above the other. The machine was crudely made, and there were several other projection problems, including an annoying flicker. Also, he used a home-made film-trap assembly, which had no pads, so he had difficulty holding his picture together on the screen.



The unbalanced periods of light and darkness for each eye in the "eclipse," or alternating-frame, method of projecting 3-D. Constant and contrary readjustments of the iris in each eye is required to compensate for the relatively long periods of light and dark. Also, image stimuli are rapidly hitting the brain, first from one eye and then from the other, instead of from both eyes at once. These two factors probably account for the visual fatigue felt by the viewer. See next page.

Special Printing Process

"Four color wheels were used in projection to obtain a picture in color on the screen from black-and-white film. It was possible to use four wheels because the projection system included two supplementary lenses mounted in a prism and mirror arrangement. The color wheel, as it spinned, was said to create the 'color content' in each frame. *A special method of printing and matching the frames* made this possible. All in

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all, the quality of the color obtained was not bad."

Many people in the industry are not aware that the alternating-frame method of 3-D projection is not a new idea and has been carefully examined by serious workers in the stereo motion picture field such as John A. Norling, who mentions alternating-frame, single-strip, 3-D photography elsewhere in this issue.

However, this method is not yet of commercial importance because of some very serious drawbacks, extremely difficult to overcome, principally eyestrain and nausea on the part of viewer. Schenstad's system does not overcome these problems. Following are some comments on the subject by Norling:

"Stereoscopic Motion Pictures"; IP for Aug. 1951 and Feb. 1952.

THE FACTS OF LIFE

"From time to time, the alternate projection of the members of a stereo pair has been proposed. In this system, the right-eye image, for instance, is projected first, then the shutter interrupts the light beam while the film moves down to position the left-eye image. Thus there are periods of flicker that occur at different times for each eye. If we break this sequence of events down, we find that the first light period has a value of 12.5% of the complete picture cycle.

"The flicker blade on the projector shutter (considering a two-bladed shutter) gives a dark period lasting 12.5% to be followed by a light period of the same, then a long dark period consuming 62.5% for pull-down and eclipse to permit the other eye to see its image.

"If standard sound-film speed of 24 frames/sec is used, the resulting flicker is very annoying. Stepping up the projection to 48 frames per second increases flicker frequency twice, but it still is noticeable. There is a physiological effect that is likely to become disagreeably apparent—usually headache or nausea—after a few minutes of viewing pictures projected in this way.

Eyestrain and Nausea

"A complete period of darkness for one eye, while light reaches the other, will probably always result in visual fatigue, if not in nausea, no matter how high, within workable limits, the flicker frequency is brought.

"Flicker of low frequency calls for traction on the control muscles of the irises when bright light enters one or both eyes. The rapid occurrence of the transmission of stimuli, first from one eye, then from the other, and the motor messages from the brain to the muscles, delivered in rapid sequence, probably accounts, in part, for the visual discom-

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fort experienced by most people when viewing "eclipse" stereo movies.

Flicker vs. Light Intensity

"Perception of flicker depends upon the intensity of the interrupted light, as well as the flicker frequency. The more intense the light, the higher the frequency must go before flicker fusion is attained.

"Also, the larger the angular field over which flicker is distributed, the greater the consciousness of flicker. Hence the dimmer the picture and the smaller it is, the lower becomes the flicker fusion frequency."

Technicolor Profits Rise

Because of the increased color requirements of the new film techniques and competition from Tv, color is assuming more importance to producers, said Technicolor, Inc., in announcing increased profits for the first quarter of this year. There are 122 pictures contracted for this year with Technicolor, whereas last year, the total was 97.

A consolidated net profit of $896,838, equivalent to 94 cents a share, for the first quarter of 1953 was announced by Technicolor, compared with a net profit of $518,948, or 56 cents a share, for the corresponding quarter of 1952. At the recent stockholders' meeting, it was voted to split the stock of Technicolor, Inc., at the rate of 2 shares for 1.

SMPTE Gathering Information for Wide-Screen Standards

A SURVEY of motion picture theatres throughout the country, for the purpose of gathering information on the maximum screen size most theatre auditoriums can effectively use, has been undertaken by the SMPTE. Data on 3-D equipment installations will also be obtained. A detailed report on the survey will be published in the near future. This information was requested by a group of industry delegates who attended the recent SMPTE convention in Los Angeles and the idea was endorsed by the Motion Picture Research Council.

Some of the questions asked are as follows: Is your theatre already equipped for 3-D? Have you increased the size of your screen to provide for wide-screen projection? What is the seating capacity of your orchestra; balconies? What is the size of your present picture, focal length of projection lens, and projection angle, if any?

Along with space to answer these and other questions, the four-page questionnaire provides diagrams of theatres with and without balconies with spaces for the exhibitor to write in such information as the width of his stage, the width of the row of seats nearest the stage, and the distance of the last row of seats from the screen. Such problems as the sight clearance line from the last row of orchestra seats, as affected by the length and height of the balcony, are also considered.

In line with IP's policy of cooperation with all standardization efforts, projectionists are urged to enquire whether this questionnaire has been received by their theatre and aid as much as possible in seeing that it is completely and accurately filled out. This comprehensive form can give a clear picture of the various physical limitations of the average theatre in using the new film processes, something that is badly needed right now.

If a questionnaire has not been received by your theatre, one can be obtained from Henry Kogel, staff engineer of the SMPTE, 40 West 40th St., New York 18, N. Y. The final report, when available, will be presented and evaluated in IP.

Kodak Producing New Plastic

Eastman Kodak announced that it has entered an agreement with Imperial Chemical Industries, Ltd., a British firm, licensing Kodak to manufacture and sell Polyethylene, a light plastic that has many applications in consumer and industrial fields.

Present plans call for the construction of a plant at Longview, Tex., with an estimated capacity of 20,000,000 pounds annually. Polyethylene in its solid resin form is tough and flexible at low temperatures; resists many chemicals; and has excellent electrical properties. It is adaptable to varied insulation and packaging uses.

Columbia Profits Increase

Columbia Pictures reports an estimated net profit of $310,000 for the past 39 weeks ending March 28, slightly ahead of the $280,000 earned in the same period a year ago. The profit is equal to 17 cents per share on 687,436 shares outstanding, as compared with 11 cents on 670,000 shares for the same period a year ago.

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Prestoseal Mfg. Corp. has an improved electric automatic splicer designed to splice 16-mm, 35-mm or 70-mm motion picture film, magnetic film tape, striped film or microfilm without scraping or the use of cement.

The PRO model Presto-Splicer operates through a combination of controlled heat and pressure applied in au automatically-controlled time-cycle. The splice is achieved without cement or scraping. Butt-welded ends produce a homogeneous bond with no loss of either picture or sound. This splice will last indefinitely.

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One improvement in the new model is that a rachet assembly has been added which advances a teflon tape applying a new pressure surface for each splicing, thereby assuring good results each time. Another improvement has been the addition of a pre-plasticizing assembly that automatically pre-plasticizes the film prior to the splicing cycle. This prevents the film from becoming brittle and allows a flexible splice under all conditions.

The Presto-Splicer handles all types of safety-film bases including tri-acetate and mylar stock. It can be used for raw stock, short ends, color film, negative, prints, and the like.

New 'Irish' Recording Tape

Orradio Industries, Inc., Opelika, Ala., announced that it is marketing an improved magnetic recording tape sold under the trade name "Irish Sound Plate."

It is claimed to have the following properties: (1) two times the tensile strength of acetate; (2) will not tear or break; (3) is unaffected by moisture or temperature change; (4) engineered for high-speed operation, 15 to 500 inches per second; (5) is not affected by static; and (6) a greater surface slip.

Spectra Screen Light Meter

The Spectra Brightness Spotmeter, a useful tool for measuring the brightness of motion picture screens, is now being marketed by the Photo Research Corp., Alameda, Calif.

A compact unit that is aimed with a pistol grip, the meter utilizes a vacuum phototube, a high-sensitivity amplifier and a microammeter. Readings are taken directly in foot-lamberts. An area as small as three inches in diameter can be measured from a point ten feet away so that the meter or operator do not interfere with the source of the light. This instrument is particularly effective in gauging light distribution for 3-D and wide-screen showings.

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Build *capacity* patronage . . . for better-than-ever profits . . . by giving *all* of your patrons the world's most satisfying screen images. Unequalled edge-to-edge sharpness and definition, at all ranges, all angles. Breathtaking contrast . . . vivid, brilliant images, actually 44% to 100% brighter! Tops in "Come back again!" appeal.

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WRITE for complete information, Bausch & Lomb Optical Co., 61618 St. Paul St., Rochester 2, New York.

Bausch & Lomb *Super Cinephor* Projection Lenses

ELECTRICAL FAILURES

(*Continued from page* 21)

has fallen below a predetermined limit. In addition, provision is made for voltage and current measurements and for checking capacitors for leakage.

Equipment Modification Needed

The military receiver selected for experimentation at the Bureau, an 18-stage guard-channel receiver, required only slight modification to adapt it to the failure-prediction system. The circuits were first examined to determine which stages were the more sensitive to component faults. Eight stages were found to be relatively insensitive; wiring was changed to permit checks on the other 10 stages.

The modification consisted in provision for breaking grid and plate leads to permit insertion of an audio signal and of a device for measuring gain. These connections were brought to a multi-point connector. (The plug from the portable failure-prediction unit is plugged into this.) The whole modification entailed use of only about 7.5 percent additional components, mostly capacitors and r-f chokes. Wiring and parts were all fitted without difficulty into available space in the receiver.

The experimental NBS prediction test unit includes a 3,000-cycle oscillator, voltage-sensing circuits, a leakage detection circuit, and an alarm light. As the main selector switch is rotated in a check of the gains of the various stages of the receiver, different predetermined levels of audio signal are applied to the grid of each stage. Each input signal is preadjusted so that, if the gain of the stage has changed by more than a safe amount, the voltage-sensing circuits will actuate the alarm light. After the test unit has been plugged into the receiver, the operator needs only a few seconds to rotate the selector switch and discover any weak stages.

A separate 3-position switch on the test unit permits capacitor-leakage sensing and voltage-and-current sensing in addition to the gain sensing. For field use the unit can be made compact and portable.

Results Obtained

In laboratory evaluation of this failure-prediction system, 1000-hour accelerated-aging processes were applied to six of the modified receivers. Prediction checks were made at five-hour intervals.

A total of 79 tube failures occurred in the six receivers during the 1,000 hour test period. Sixty-five of these failures, or about 80 percent, were of a gradual and therefore predictable nature, while the others were caused by unpredictable open or short circuits. (These were caused mostly by *shock*, a condition to which civilian equipment is not exposed.—Ed. note.)

Of the 65 predictable tube failures 58 were accurately predicted many hours before the receiver stopped functioning. Of the seven predictable failures not successfully predicted, two were in circuits not undergoing check. Failures of components other than tubes were negligible and do not warrant any conclusions as to predictability.

Value of the Process

As applications of radio and electronic equipment continue to increase in extent and importance, problems of maintenance and reliability become more and more serious. This is particularly true of military electronic equipment. In addition to depending on it extensively for military communications, the Armed Forces increasingly rely on electronic equipment for radar detection of aircraft and vessels, for the automatic aiming, firing, and detonating of weapons and missiles, and for numerous instrumentation and control applications. The inevitable complexity of much of this equipment augments the danger that failures of components will cause failures of essential equipment at critical times.

Although much progress has been made toward better electronic dependability, particularly through improved-quality components, the reliability of present-day electronic equipment still leaves much to be desired. In some large and highly specialized electronic installations, such

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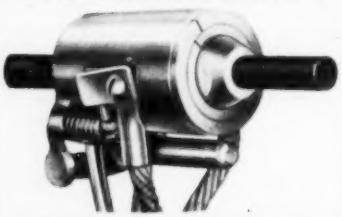

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as the Whirlwind computer, valuable means for automatically detecting marginal conditions have been built into the equipment. However, very little study seems to have been made of the practical possibility of detecting incipient failures by means of simple routine checks with portable test equipment.

The fact that large bombers may use some 2,000 vacuum tubes suggests the magnitude of the problem of attaining satisfactory reliability in military electronic equipment. It has been estimated that a typical home television receiver, with about 20 tubes, averages one tube failure for every 1,200 hours of operation; with the same rate of failure, a plane with 2,000 tubes would have one failure every 12 hours. The much more severe environmental conditions in the plane increase failure probabilities.

Either sudden or gradual failure of a tube or other component may cause failure of electronic equipment to function properly. The NBS work has been concerned with practical means of spotting these gradual failures in advance.

The principles of measurement on which the NBS failure-prediction work has been based are not new; yet until now very little has been done toward development of practical techniques for semi-automatic checks for detection of incipient failures.

HYPERGONAR SIDELIGHTS

(*Continued from page* 15)

drawing, the story is much different. We see lenses with plano-convex and concave characteristics capable of compressing the image on the horizontal plane. The result is that a film with an aspect ratio of 4 by 3 records a compressed image that actually has much different proportions than the film.

When this film is projected through a Hypergonar projection lens system, the distortion caused by compression on the horizontal plane is corrected and the image on the screen has an aspect ratio of 2.66 to 1. The principle, as Prof. Chretien mentions in his article, is similar to the compression and elongation that occur if we look at ourselves in the "crazy mirrors" at an amusement park. The distorted image of these mirrors can be corrected if the image is viewed through another mirror shaped to counteract the distortion.

COMMENTARY

I have read with great interest both the French article in *La Technique Cinematographique* and IP's exposition of Chretien's Hypergonar lens-system. It would seem to me that IP's explanation is both accurate and lucid.

The aspect-ratio of 2.66 to 1 given by IP applies, of course, only to the present American Fox "CinemaScope" method employing a camera-aperture identical with the old "silent" aperture. It is of interest to note that Fox is vigorously pushing its new proposal to alter the 35-mm standard in such a way that three 0.050" magnetic stereo-sound tracks and one 0.029" magnetic control (or effects) track are carried on the picture film.

It is proposed that the width of the perforations be reduced from 0.110" (ASA Z22.36 1944) to 0.078". The picture-frame would be reduced in width by one of the 50-mil tracks and the 29-mil control track so that the CinemaScope aspect-ratio *on the screen* would be 2.55 to 1, in spite of the reduction in sprocket-hole width. Projector manufacturers believe that the industry, by and large, is opposed to the Fox proposal.

I, personally, am strongly opposed to the new 35-mm film standard proposed by Fox. First, I am opposed to the wide screen on optical and esthetic principles. Then, too, I do not look for satisfactory sound reproduction from magnetic tracks so narrow as those proposed—ratio of signal to ground-noise level too low. Again, the use of narrower sprocket-teeth in projectors will result in increased film wear and a deterioration of picture quality. The last criticism is especially cogent in view of the fact that acetate film does not possess quite as high a tear-strength as nitrate projection film.

I believe that IP's excellent discussion of the Hypergonar lens-system will be appreciated by projectionists.

DR. JOSE FERNANDEZ

Buenos Aires, Argentina

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VISIBILITY FACTORS

(Continued from page 12)

that it will not tolerate candlelight projection, no matter how wide and handsomely curved the screen may be.

In the days before reflector lamps and high-intensity arcs had become available, movies were much too dim in a large number of theatres. In an effort to compensate for the lack of light, laboratories issued "thin" prints, and theatre managers kept their auditoriums very dark while pictures were being shown. The widespread use of amber-tinted film stock for making silent movies actually cut the light down to 70 or 80% of normal, but the sunshiny hue created an illusion of increased brightness.

Too Much Light

A projected picture can be too bright as well as too dark. One extreme is as bad as the other. In no case should screen brightness exceed 45 or 50 footlamberts, for excessive brilliance causes shutter-flutter to become annoyingly conspicuous. There will be little pictorial gain except for an increase in contrast—a wider range of luminosities from the deepest blacks to the brightest whites. Normal brightness (15 footlamberts) is sufficient to reproduce the entire scale of tones in the film-images. (The writer regards a screen-brightness of 30 footlamberts as the most satisfactory level for both black-and-white and color.)

The 48 alternations of light and dark per second become literally dazzling when brightness exceeds 100 footlamberts. The projectionist can convince himself on this score by placing a large sheet of white cardboard about 10 feet from the projector porthole by means of a tall pole and showing a picture on it. The small, extremely bright picture will be seen to flicker violently. The same effect is produced by projecting blank light on the regular theatre screen with the projector running.

Lighting Limitations

Tripling the arc-lamp current, with suitable carbon trims, will indeed provide the desired 15 footlamberts of screen brightness for CinemaScope, if the conventional screen has that degree of brightness; but this expedient is clearly impossible in most medium-size and all large theatres. Lamps so powerful are not to be had; and even if they were, the film could not stand so much heat. Drive-ins, we fear, will have to struggle along without CinemaScope.

Polarized-light 3-D also has brightness difficulties. Because each eye sees only one image of the superposed stereo pair on the screen, the use of two projectors running simultaneously does not double effective illumination. Further, the Polaroid filters placed over the projector lenses and the eyes of patrons reduce effective illumination to about one half of normal, reckoned as an overall average for all positions in the auditorium.

Aluminum-Surfaced Screen

The aluminum-surfaced screen necessary for polarized-light 3-D increases apparent picture-brightness in the middle of the auditorium, but it drastically reduces brightness beyond the optimum viewing section inside a 10-degree solid angle having its vertex at the middle of the screen and its axis slanting downward at an angle equal to the tilt of the projectors.

In general, however, it may be considered that no polarized-light 3-D projection will appear as bright as conventional movies unless the arc amperage be nearly 1½ times normal in each projector. Since two projectors are operated at the same time, 3-D requires about 3 times the current-consumption of conventional projection.

DISTRIBUTION OF LIGHT

Brightness-distribution has two aspects: the uniformity of illumination projected upon the screen and the distribution of the light reflected by the screen throughout the auditorium. The latter aspect involves the specular characteristics of the screen itself. White matte screens are now considered to be the most suitable kind for all except long, narrow theatres; and since matte screens are very good diffusers of light, their use obviates the problem of changes in picture-brightness as an observer moves about the auditorium.

Natural Vision 3-D cannot make use of matte screens, however, because this type of screen, having a dielectric reflecting surface, converts plane-polarized light into ordinary, non-polarized light. Such a conversion nullifies the effect of the Polaroid filters placed over the picture-machine lenses. Metal-surface screens must be used because they affect plane-polarized light not at all when viewed from directly in front of the screen, though they unfortunately induce elliptical polarization as the viewing angle is increased relative to the angle of incidence.

Polarization Factors

Excessive elliptical polarization permits the left eye to see the right-eye image faintly, and *vice versa*. This is why Natural Vision ought to be viewed within five degrees of a straight line extending from the middle of the screen up through the middle of the auditorium. To sit too far at one side results in an out-of-focus double picture, as well as in a dim one.

It is also of interest to note that the 3-D observer must hold his head perfectly straight to get the 3-dimensional effect and to avoid the fuzzy double image. If the head is tilted, each eye sees the wrong image as well as the proper one. In fact, the 3-D effect is *completely* destroyed when the observer tilts his head at an angle of 45 degrees—the amount of 3-D deterioration being directly proportional to the sine of twice the angle of head-tilting!

[TO BE CONTINUED]

Correction Anent CinemaScope

In the article "Visibility Factors in Projection," by Robert A. Mitchell, in IP for May, there appeared a reference to the CinemaScope process (foot of Col. 3, page 7) as follows:

". . . . The trick is turned by optical wizardry. Over the camera lens is placed a cylindrical lens that 'compresses' a wide field into the regular aperature. The prints are made in the ordinary way; but when they are shown, an achromatic cylindrical lens is placed over the projection lens. Being turned to an angle of 90 degrees to the position of the camera cylindrical lens, this lens performs an *opposite* function—it *expands* the *squeezed* photograph to wide-screen proportions."

The foregoing statement is in error, because the projector hypergonar lens is *not* turned to an angle of 90 degrees to the position of the camera hypergonar. They both are positioned exactly the same.

20th-Fox Buys Hurley Screen

Hurley Screen Co., Long Island, N. Y., has been acquired by 20th-Fox along with a screen processing plant in New Jersey. In view of the growing flow of CinemaScope lenses from Bausch & Lomb, the big CinemaScope equipment bottleneck now is stereophonic sound.

It is understood that RCA, Westrex and others are going into extra work shifts in order to produce the necessary units.

"God: Give me the strength to smile..."

Smile, and hold back your tears: SHE *must not see them.*

Keep secret the voice that is crying inside of you: SHE *must not hear it.*

Smile...that she may sense no echo of the voice YOU *heard this morning —the surgeon's voice, gentle and hopeless. "I'm sorry. I'm afraid we're too late."*

* * * * * * *

"Too late..." Cancer, the most terrible scourge of all, last year killed 70,000 Americans who would have lived if treated in time. Few indeed are the Americans whose lives will never be shadowed by this monstrous and implacable enemy. It may be you. Your wife, your parents. Your children...

"Too late..." The bitter, pitiful truth is that we Americans—the most generous people on earth—have not yet contributed adequately to the war against cancer. And some are paying immeasurably in agony and grief, because there is not enough money.

Is there hope—? Hope of a final, certain cure for cancer—?

Yes, there is hope. Night and day our medical laboratories are forging the swords of knowledge. But not as fast as we all wish and pray they were—there is not enough money...

Far from enough! Last year, the American Cancer Society was able to allocate only $4,100,000 for cancer research—less than three cents per American per *year!* Yet, as things stand today, 22 million Americans will die of cancer—for cancer strikes one out of five. How long can we remain so indifferent to this monstrous thing—how many lives can we afford to throw away—?

Won't *you* please contribute—now, before you forget again? *Please* let your contribution be as large as your faith, and as heartfelt as your prayer...that, working together, we can lift this sorrow not only from our own time and nation, but from all the ages of man to come...

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